

THE GERMINATION OF TEAK

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SUMMARY

The slow and sporadic germination of teak seed is a disadvantage to the forester for several reasons.

At the Teak Improvement Center it has been observed that the germination rate can be increased considerably by removing the exocarp of the fruits. This is illustrated by the diagrams fig. 2-9.

The removal was done by exposing the fruits to ants which consumed the exocarp in 1-2 weeks. During the period of exposure only negligible loss of seed occurred.

It is characteristic of teak that its seed germinate sporadically. A batch of fruits will normally start to sprout ca. 10 days after sowing, but even when conditions seem favourable it may take three months or more till all seeds capable of germinating have developed.

One result of the prolonged germination is uneven sized plants. Many seedlings are too small for transplanting to the cultivation area at the beginning of the following growing season and the manner of germinating implies consequently a wasteful use of seed or nursery space. It is particularly unfortunate if the seedlings are to be used for experimental purposes.

A speedy germination is also desirable if one wishes to get an impression of the germination percentage which can be expected from a certain portion of fruits. A test that takes very long may be of little practical use if the bulk of the seed has deteriorated in the meantime or it has become too late in the season to sow.

These considerations led the Teak Improvement Center to observe the germination and the growth of seedlings under various conditions, partly in the nursery, partly in small scale germination tests.

Some of these observations are described in the present report.

The teak fruit

The teak fruit is a so-called drupe or stone fruit. It is composed of the exocarp, a relatively thick and leathery substance and

the endocarp or stone which normally contains four seed chambers (fig. 1A). The surface of the stone is rough, provided with protuberances and ridges which cause an almost complete integration with the exocarp (fig. 1A and B). The whole structure is loosely enveloped by a membranous cover which originates from the calyx of the flower.

Only rarely do all four seed chambers hold seed. Of 100 fruits in the diameter class 10,5-11,5 mm 34 fruits were empty, 44 held 1 seed, 16 fruits contained 2 seeds, 4 fruits 3 seeds, and 2 fruits 4 seeds.

At germination the endocarp cracks along the walls of the seed chamber (fig. 1B and C). The fact that the fruit frequently opens even if there is no seed present in the respective seed chamber leads to the assumption that the opening of the fruit is achieved mechanically by expansion and contraction of the endocarp at varying vapour pressure.

This process is likely to be retarded by the exocarp which forms an isolating layer.

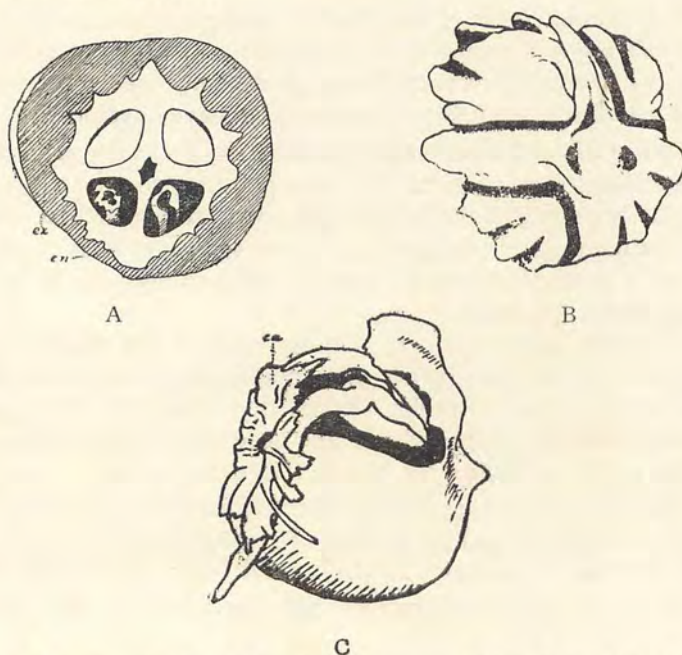


Fig. 1. A. Cross section of teak fruit showing exocarp (ex), endocarp (en), 2 full and 2 empty seed chambers ($\times 5/2$). B. Endocarp, 3 seed chambers about to open ($\times 3$). C. Teak fruit germinating, ca = fragment of calyx ($\times 5/2$).

The treatments

The fruits employed in the germination tests were part of a lot collected in the natural teak forest at Huey Tak in March 1965. They were graded according to size, the medium grade (10,5-11,5 mm diam.) being used for most of the tests. All fruits with external faults were discarded.

The basic treatment is removal of the exocarp. It was done in one case (test no. 4) by hand, otherwise by spreading the fruits on the ground under cover thus exposing them to attack by ants. The exocarp on the majority of the fruits was consumed in 10 days, the loss of seed appeared insignificant even after several weeks of exposure. In the following this treatment is being referred to as the "ant treatment".

The germination was observed in boxes with topsoil (tests nos. 1-4) and in moist filter paper, generally covered with polyethylene (tests nos. 5-8).

The results

The following diagrams (fig. 2-9) illustrate the germination at different periods from the time of sowing. They represent the number of *seeds* germinated in percent of the number of *fruits* sown. When a test is replicated the diagram shows the average of the plots.

Discussion

The tests demonstrate that the rate of germination can be increased by removal of the exocarp and that a further increment is possible by a very short soaking and drying treatment.

It is striking that the germination percent of the untreated fruits in all the tests is extremely low. In a nursery experiment started on 10.6.65, the germination of fruits of the same source and grade averages 20-30% 40 days after sowing, and almost 50% 60 days after sowing. It is probable that the results of the tests are low, because they were made later when the average daily temperature and the length of the day were decreasing. To this may be added that in respect of the filter paper tests, the conditions for decomposition of the exocarp are not present in the same measure as in the soil.

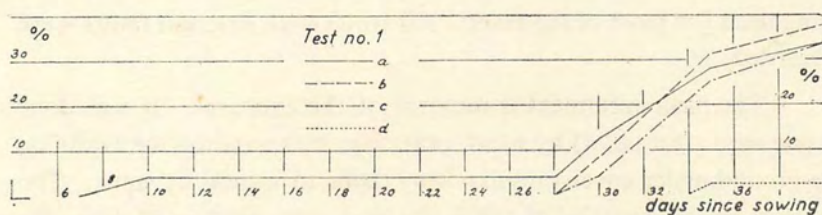


Fig. 2

Test no.	Date of sowing	Seed source	Grade (mm diam.)	Medium	No. of repl.s	No. of fruits pr. plot
1	22.7.65	Huey Tak March 1965	10,5-11,5	topsoil	1	48

Treatments :

- a) "Ant treatment" 9.7.65-20.7.65, exocarp completely consumed.
- b) 1. Same as a). 2. Soaking 48 hours 20.7.65-22.7.65.
- c) Same as a), exocarp not consumed.
- d) No treatment.

The test was started in the shade house and after 20 days continued in the open. Apart from illustrating the relatively fast germination of the treated fruits it appears that temperature or light conditions in the shade house have delayed the development.

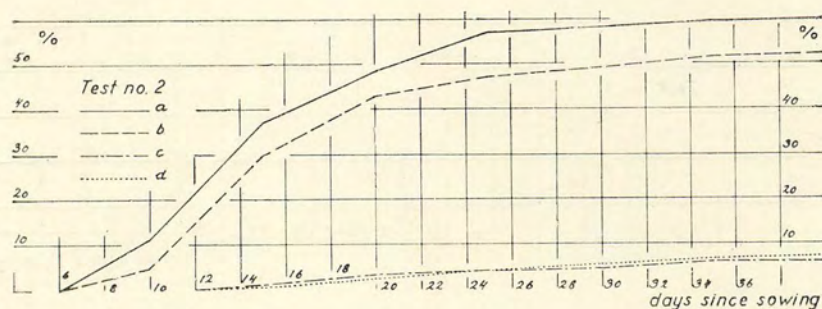


Fig. 3

Test no.	Date of sowing	Seed source	Grade (mm diam.)	Medium	No. of repl.s	No. of fruits pr. plot
2	13.8.65	Huey Tak March 1965	10,5-11,5	topsoil	3	48

Treatments :

- a) "Ant treatment" 9.7.65-11.8.65.
- b) Same as a), shaded till 30.8.65.
- c) No treatment, shaded till 30.8.65.
- d) No treatment.

The longer duration of the "ant treatment" seems to have had no adverse effect. The object of shading two of the plots was to provoke a quick germination on removal of the shade frames.

The test was made in 3 replications. Analyses of variance made at the stages 15 and 40 days after sowing show that the differences between the treated plots (a) and b) and the untreated plots (c) and d) are highly significant (confidence limits 23,5% and 36,3% respectively at $p=0,01$)

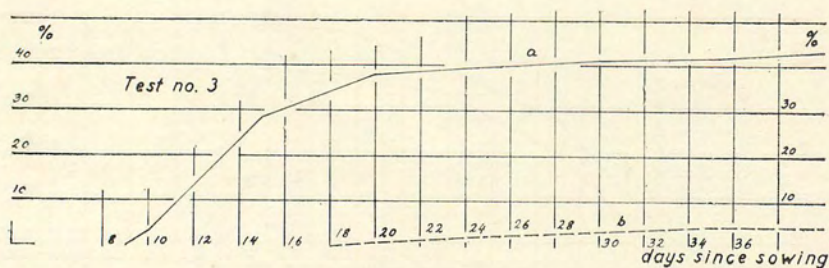


Fig. 4

Test no.	Date of sowing	Seed source	Grade (mm diam.)	Medium	No. of repl.s	No. of fruits pr. plot
3	27.8.65	Huey Tak March 1965	10,5-11,5	topsoil	2	96

Treatments :

- a) "Ant treatment" 9.7.65-27.8.65.
- b) No treatment.

In order to investigate whether prolonged "ant treatment" has any effect on survival and germination the fruits were exposed to treatment for 7 weeks.

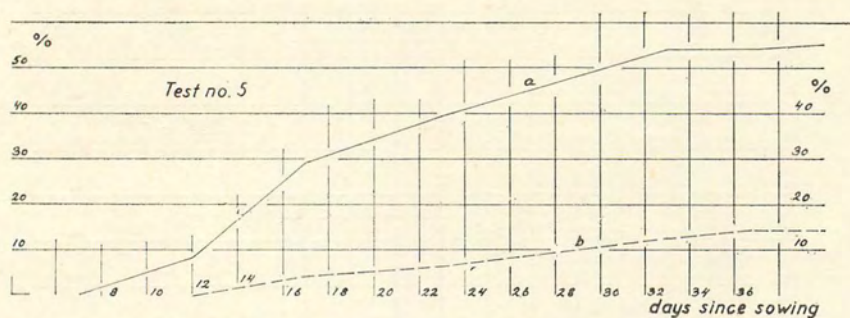


Fig. 5

Test no.	Date of sowing	Seed source	Grade (mm diam.)	Medium	No. of repl.s	No. of fruits pr. plot
5	24.8.65	Huey Tak March 1965	10,5-11,5	Filter paper	1	48

Treatments :

a) "Ant treatment" 9.7.65-11.8.65.

b) No treatment.

Treated and untreated fruits germinating in moist filter paper placed in the open.

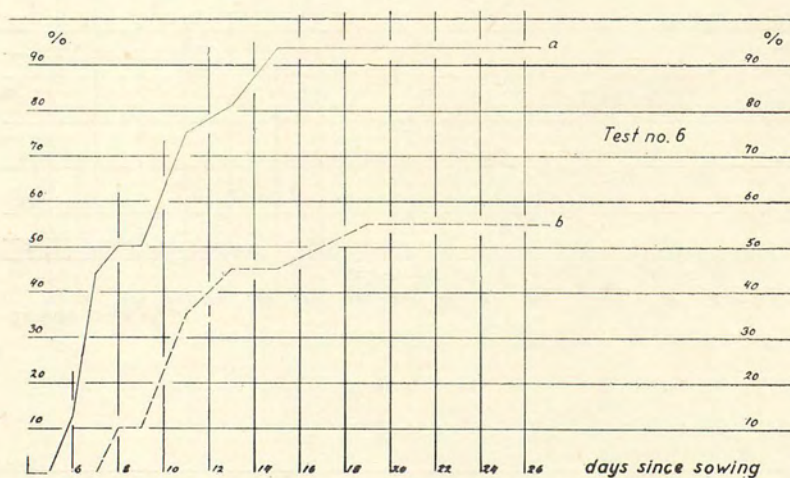


Fig. 6

Test no.	Date of sowing	Seed source	Grade (mm diam.)	Medium	No. of repl.s	No. of fruits pr. plot
6	1.10.65	Huey Tak March 1965	10,5-11,5	Filter paper	1	a) 16 b) 20

Treatments :

a) 1. "Ant treatment" 9.7.65-11.8.65. 2. Soaking alternating with sundrying 1.10.65 (4 times soaking, 3 times drying in 30-45 min. periods).

b) "Ant treatment" 9.7.65-11.8.65.

In this and the following tests the filter paper was covered with polyethylene in order to increase the temperature.

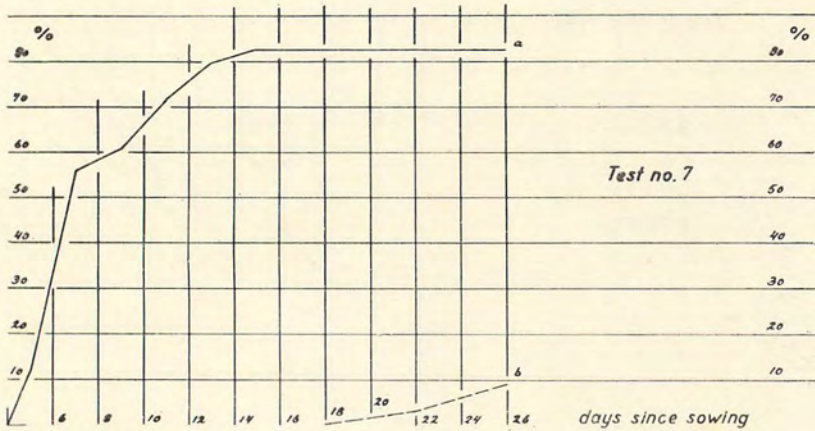


Fig. 7

Test no.	Date of sowing	Seed source	Grade (mm diam.)	Medium	No. of repl.s	No. of fruits pr. plot
7	7.10.65	Huey Tak March 1965	10,5-11,5	Filter paper	1	a) 34 b) 33

Treatments :

a) 1. "Ant treatment" 9.7.65-11.8.65. 2. Soaking alternating with sundrying 6.10.65-7.10.65 (30-45 min. periods, continued till all fruits opened, soaking during the night).

b) Soaking alternating with sundrying 6.10.65-7.10.65 (60-90 min. periods, soaking during the night).

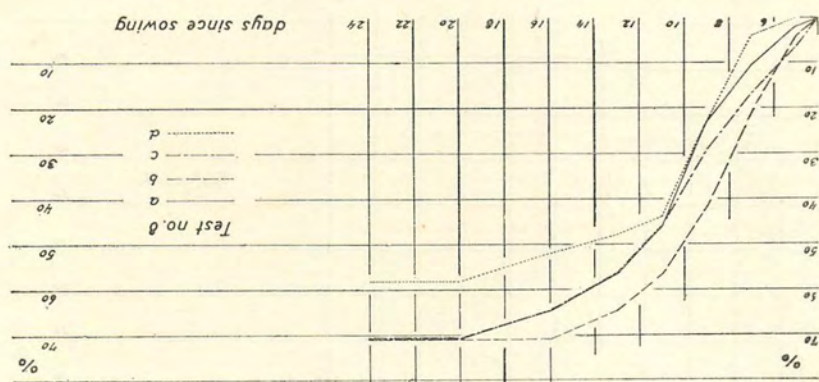


Fig. 8

Test no.	Date of sowing	Seed source	Grade (mm diam.)	Medium	No. of repl.s	No. of fruits pr. plot
8	9.10.65	Huey Tak March 1965	10,5-11,5	Filter paper	1	48

Treatments:

a) 1. "Ant treatment" 9.7.65-27.8.65. 2. Sprinkling with water alternating with sundrying 8.10.65-9.10.65.

b) 1. "Ant treatment" 9.7.65-27.8.65. 2. Soaking alternating with sundrying (soaking 4 times, drying 3 times in 30 min. periods) 9.10.65.

c) 1. "Ant treatment" 9.7.65-27.8.65. 2. Soaking 3 hours, sundrying 45 min.s, soaking 30 min. 9.10.65.

d) "Ant treatment" 9.7.65-27.8.65.

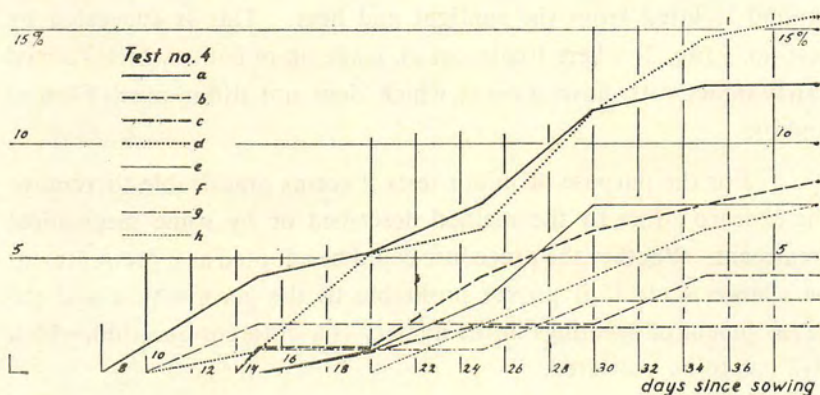


Fig. 9

Test no.	Date of sowing	Seed source	Grade (mm diam.)	Medium	No. of repl.s	No. of fruits pr. plot
4	5.9.65	Huey Tak March 1965	see treatments	topsoil	2	48

Treatments:

- a) 7,6-9,5 mm diam., exocarp removed with knife.
- b) 9,6-11,5 „ „ „ „ „ „
- c) 11,6-13,5 „ „ „ „ „ „
- d) 7,6-13,5 „ „ „ „ „ „ (not graded, fruits with external faults discarded).
- e) 7,6-9,5 mm diam.
- f) 9,6-11,5 „ „
- g) 11,6-13,5 „ „
- h) 7,6-13,5 „ „ (not graded, fruits with external faults discarded).

It is not possible to remove the exocarp completely by cutting and this seems to be reflected in the poor germination.

Three grades of fruits have been employed. There is a tendency for the small fruits to germinate fastest.

While it is assumed that the great improvement of the germination rate is caused mainly by the removal of the exocarp, it may also be a beneficial pretreatment for the fruits to be left on the naked ground isolated from the sunlight and heat. This is suggested by test no. 1 (fig. 2) where treatment c), made up of fruits which seemed fairly intact still shows a curve which does not differ much from a) and b).

For the purpose of minor tests it seems practicable to remove the exocarp either by the method described or by some mechanical treatment. Whether the procedure could be adopted as a pretreatment on a larger scale if it proves profitable to the germination and the development of seedlings in the nursery is a different question, which still has to be answered.